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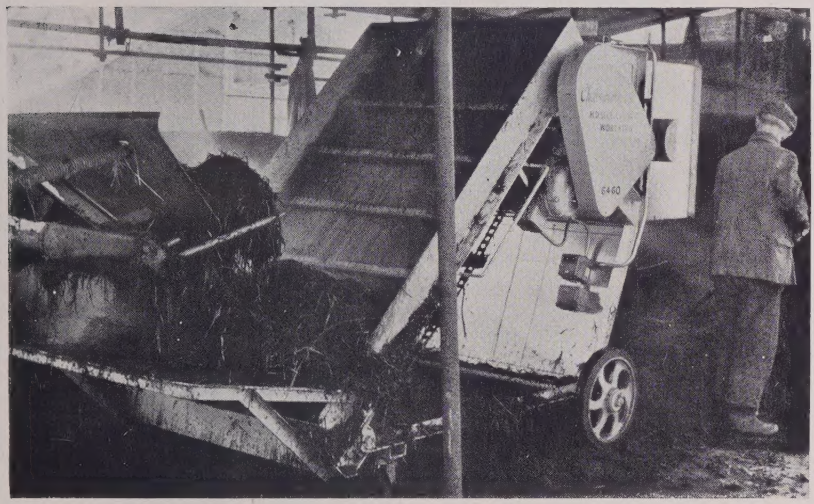

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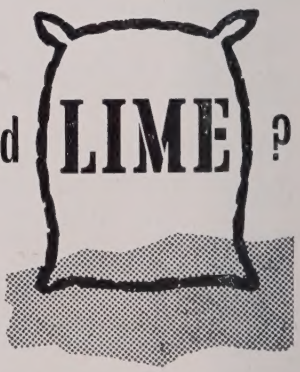

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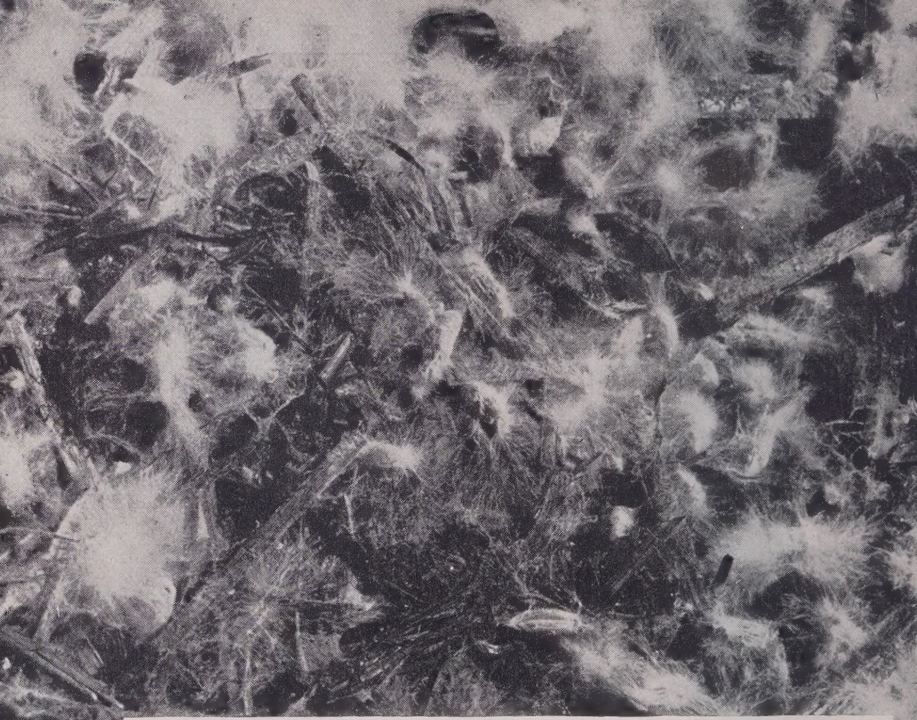

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EDITORIAL

IN THE SOUP

Can anyone recall seeing mushrooms advertised in such a wide variety of forms as recently? Fortnum & Mason have tins of Mushroom Chou Mien, Champignon Bisque and, of course, Champignons in Butter, jars of Mushroom Savoury Pâté and Cocktail Mushrooms in Dill, in White Wine, Madeira, Sherry and Port. Grays of Worcester are now offering "yet another selection of new American canned foods", including Scallops in Mushroom Sauce. Fregata Merchants Ltd. of Cromwell Road advertise "an exciting new Mushroom Soup from Poland—a delight to the gourmet". Smedley's canned Ravioli and Cannelloni both have a rich tomato sauce garnished with sliced mushrooms, "a luxury touch which adds to the flavour". Three Cooks Ltd., are now marketing products which contain vacuum freeze dried ingredients, such as their Continental chicken and mushroom soup . . .

All very good for our business, provided the mushrooms *are* mushrooms ! The American Mushroom Institute is bravely attempting to persuade the U.S. Dept. of Agriculture to reserve the term "mushroom" for *Agaricus campestris* only, and to have the word "toadstool" applied to all but cultivated mushrooms.

Before we can hope for such a desirable limitation perhaps we should be more precise about what the cultivated mushroom is. Some people call morels mushrooms, and morels have been "cultivated"! And whether we call our mushroom *Agaricus hortensis* or *Agaricus bisporus*, it is certainly not *Agaricus campestris*.

FCA

SUPER SPAWNING

C. Riber Rasmussen

Additional to the published programme for the conference at Weston-super-Mare in October of last year, Mr. C. Riber Rasmussen, head of mushroom research in Denmark, gave a short résumé of the progress of his experiments, to date, in the field of super spawning which followed his original work on this new experimental field.

He prefaced his short talk by saying that super spawning did not entail a saving in the amount of spawn used. In fact, in his experiments the standard rate of spawning was used. Super spawning seemed to be working very well and the yield was proportionate to the amount of compost used. The method is as follows :—

A tray is spawned with three times the quantity of spawn normally used. This grows very quickly and within 14 days the tray is ready. Then this fully grown tray is mixed with two newly pasteurized trays and it is then turned out into bigger trays. The trays used for pasteurization and those used for spawn run are of the same size i.e. 8 sq. ft. and 7 to 8 inches deep. When the spawned tray and the two trays from the pasteurization room are ready, they are then mixed into big trays of about 16 sq. ft. and 10 to 11 inches deep. These are now placed in special trays—shelf trays—which are made of strong wood and are on legs. After this operation there is really a shelf system. The trays are immediately cased and moved by means of a truck into a special room which has to be controlled from the word " go ". After four to five days, a very high temperature rise takes place. We have seen the temperature rise in five days from 22° C. to 30° C. and this temperature rise is a very important feature of super spawning. This temperature rise is easily controlled by cooling facilities in this special room. The air temperature is cooled down to about 16° C. and when this is done the temperature in the trays does not rise. If the air temperature is not cooled down, the temperature goes higher and kills the mycelium, but we have found that we can go as high as 32° and 33° C. without any damage to the mycelium. These trays are kept in these special rooms until the first pinheads show. Then the trays are placed in a normal growing room and with this system we have been able to have eight crops a year, taking about 35 days per crop ; and because of the great amount of compost, we have produced some very big yields on a commercial basis. There are some problems involved in this system, I know, but we have found that by using the greater amount of manure, the yield has been in proportion to the amount used and the result obtained in 40 days or less—the same as for trays containing one third the amount. This result is true for beds up to ten and eleven inches in depth, but beyond this depth the production of CO_2 limits the yield.

Editor's Note : 22° C. to 30° C. = 72° F. to 86° F. 32° C. to 33° C. = 90° F. to 92° F.

IMPORTS FROM EIRE STILL RISING

More than double 1954 figure

Only significant increase in consignments of fresh mushrooms to this country during 1960 were those from Eire from which country came 13,466 cwts. valued at £209,668 (2/9¼d. per lb.) against 11,608 cwts. in 1959 valued at £150,910 (2/4d. per lb.).

In 1954 Eire sent 6,303 cwts. which realised £110,608 and it is not without significance that the weight in 1960 was more than double and the amount of money realised nearly so. The fact that the total monetary return showed a comparatively small drop in the period quoted is of particular interest.

Last year, with France sending 162 cwts., Belgium 17 cwts. and Austria 2 cwts., there was little other change.

There seems no doubt at all that, in the three year period under review in the tables produced herewith, the hot weather of 1959 had much to do with the drop in prices.

Month	1958	1959	1960	1958	1959	1960
	Cwts.			£'s Sterling		
Jan.	993	686	1,177	15,673	11,752	20,399
Feb.	747	2,095	1,309	12,216	14,335	18,111
March	982	789	1,204	17,214	13,642	21,244
April	851	871	1,450	14,765	14,350	19,965
May	996	880	1,403	17,181	14,306	20,541
June	951	1,762	1,233	16,767	19,571	17,840
July	853	755	886	15,165	10,089	13,447
Aug.	573	669	918	9,480	5,758	14,437
Sept.	854	685	1,009	15,179	9,762	16,548
Oct.	1,035	766	1,106	16,799	11,712	18,126
Nov.	904	735	990	15,131	11,421	16,067
Dec.	656	915	781	10,399	14,212	12,943
TOTAL	10,395	11,608	13,466	175,969	150,910	209,668

3/- per lb. 2/4 per lb. 2/9¼ per lb.

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If you are considering buying a new boiler, oil or solid fuel, together with the necessary additional equipment, it will be to your financial advantage to make enquiries through the MGA Secretary, who will be pleased to answer any queries. It is hoped, over the next year or two, to introduce some degree of standardisation with regard to mushroom farm heating and thus reduce the not inconsiderable costs.

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Weston-Super-Mare, October, 1960

SOME ECONOMIC CONSIDERATIONS IN THE CONTROL OF MUSHROOM PESTS

N. W. Hussey, Ph.D., B.Sc. & I. J. Wyatt, B.Sc.
Glasshouse Crops Research Institute, Littlehampton

Summary

The concept of complete hygiene has been questioned and the importance of establishing the ultimate benefits of a control operation in the light of economic returns is stressed. Problems in the control of each of the common insect pests have been outlined with emphasis on differences in cost of the various control methods.

Introduction

It is widely held amongst those interested in mushroom growing that strict hygiene, involving the complete elimination of pests, is the ideal towards which cultural operations should be directed. On theoretical grounds this approach seems sound commonsense but everyone will realise how difficult it is to achieve in practice. In fact it would only be possible in ideally designed buildings within which the compost would always be under cover in an atmosphere free of insects. The average grower must cater for the continual invasion of flies from outside and it is, therefore, worthwhile to re-examine the objectives of the control methods used in the cold light of economic returns.

Such an economic examination should be conducted for each pest against the background of its biology and the extent of crop loss for which it is likely to be responsible if the circumstances are particularly favourable to the insect. We have therefore formulated some ideas which we trust will stimulate discussion and, most important, focus attention on the desirability of considering what cash return you are likely to get for money invested in control methods.

In the estimates of costs which follow it has been assumed that we are considering 1,000 sq. ft. of bed surface and therefore, under the normally accepted air/bed ratios, about 5,000 cu. ft. of air. In attempting to assess the crop value of this bed area we have assumed an expected crop of $1\frac{1}{2}$ lb./sq. ft. over six weeks selling at 3/- per lb. which would give a value of £225.

Each pest will be dealt with separately and the cost of carrying out the more usual control methods compared.

Cecids

The life history of these curious insects must be thoroughly appreciated before control methods can be appraised. The most important feature of the biology of Cecids is, of course, paedogenetic reproduction

by which larvae give birth to daughter larvae without the other developmental and adult stages normally found in insects. This unusual method of population increase ensures that, once Cecids are established in compost, they can increase in numbers without appearing on the bed surface at any time. In the past various chemical treatments have been recommended for the control of Cecid larvae believed to remain in the wood of the trays after cropping and so possibly be carried to the next crop. Hussey & Wyatt (1958) have shown that the larvae are killed by temperatures as low as 114° F. maintained for one hour so that there is no reason for supposing that normal peak-heating practice does not start the grower with Cecid-free compost at spawning. Our experience with the light-trap operated at Littlehampton suggests that adults enter the house in small numbers soon after spawning and it is these flies which initiate the attacks. It is also possible that in some cases initial infection may occur through the accidental introduction of larvae on implements or clothes from other cropping houses. The latter possibility points to the importance of ensuring that the implements and workers dealing with newly spawned compost are not contaminated from other parts of the farm. The adults referred to earlier are attracted to the rapidly growing spawn and so are not likely to spend long in the air before entering the compost for oviposition. Most insecticides however require a few hours before they take effect. Aerial insecticides are therefore almost useless except perhaps in the case of the continuous vaporisation of a repellent chemical. We have no knowledge as to whether any material on the bed surface would deter oviposition but, as only a single egg can initiate an infestation, it is unrealistic to attempt prevention of egg laying by chemical means.

The results of work at Littlehampton (Hussey, Wyatt & Hughes, 1960, *a,b*) have shown that Cecids have virtually no detectable influence on yield, but, depending on the species and the time of infection of the beds, they may damage a considerable proportion of the crop by climbing up on to the sporophores. The white species, *Heteropeza pygmaea*, tends to leave the compost 9-10 weeks after spawning regardless of the numbers present in the beds. This migration is apparently stimulated by some alteration in the nutrient value of the mycelium with age. Assuming that no control was attempted until damage became obvious the grower would only need to treat for the last three weeks of a six week cropping period. To date no scientific studies have been made on controls aimed at stopping this larval wandering once it has been initiated and the problem is complicated by the fact that dusts of BHC or DDT would prevent picking for 14 days if the recommendations of the Crop Protection Products Approval Scheme are to be followed. In these circumstances Nicotine is almost the only material which has shown promise and when watered on at 3 fl. oz. over 1,000 sq. ft. would cost (including labour) about 7 -. Applied weekly therefore the cost would be about 21 -. If the infestation was not controlled about 50% of the production of the latter half of cropping would be affected under the most severe conditions, i.e. early infection of all trays. In practice however actual damage is on a lower scale than this and assuming the pro-

duction levels quoted earlier we believe that losses of about £20 would be severe.

In the case of the species *Mycophila speyeri* and *M. barnesi* which have orange larvae, reproduction is more rapid and migration up on to the mushrooms takes place when the larval population rises above a certain density level. The extent of sporophore contamination is therefore markedly influenced by the date of bed infection. If oviposition, or contamination, takes place within three weeks of spawning, damage may occur throughout the cropping period. If cropping begins before infection occurs the bulk of the crop will be harvested before damage is significant. The Nicotine applications would therefore have to be made at least six times at a total cost of 42 -. These *Mycophila* species tend to wander more as larvae than *Heteropeza*, so that contamination between trays is more likely. Under the most severe conditions about 50% of the mushrooms would be affected but under average circumstances it seems likely that the damage potential should be put at about £40.

It must be stressed that other types of control such as fumigation, sprays and dusts have not been found effective so that none of the money spent on the routine application of these methods is likely to give any economic return. The Nicotine treatment advocated by some growers represents the same percentage control investment in terms of crop value protected for each species, namely 105 - per £100 potential crop loss. It is possible that a cheaper and safer (from the residue standpoint) technique for attacking migrant larvae may be developed but in the meantime the use of Aldrin incorporated in the casing before application to the beds is the most satisfactory insurance against Cecid species. The use of Aldrin at 10 p.p.m. (1¼ fl. oz Aldrex 30 ton of peat and chalk) would cost about 1 -. The most satisfactory method of incorporating the Aldrin has not yet been investigated but if the damp peat is spread out on a concrete surface and the Aldrin applied in as little water as possible by watering can, before the chalk is mixed in thoroughly, the cost would be about 14 -. This material can therefore be used at a percentage investment of 7 - per £100. This seems a worthwhile insurance as, in our experiments so far, it has proved completely effective, is probably also useful against other pests, and is cheaper than the doubtful Nicotine palliative.

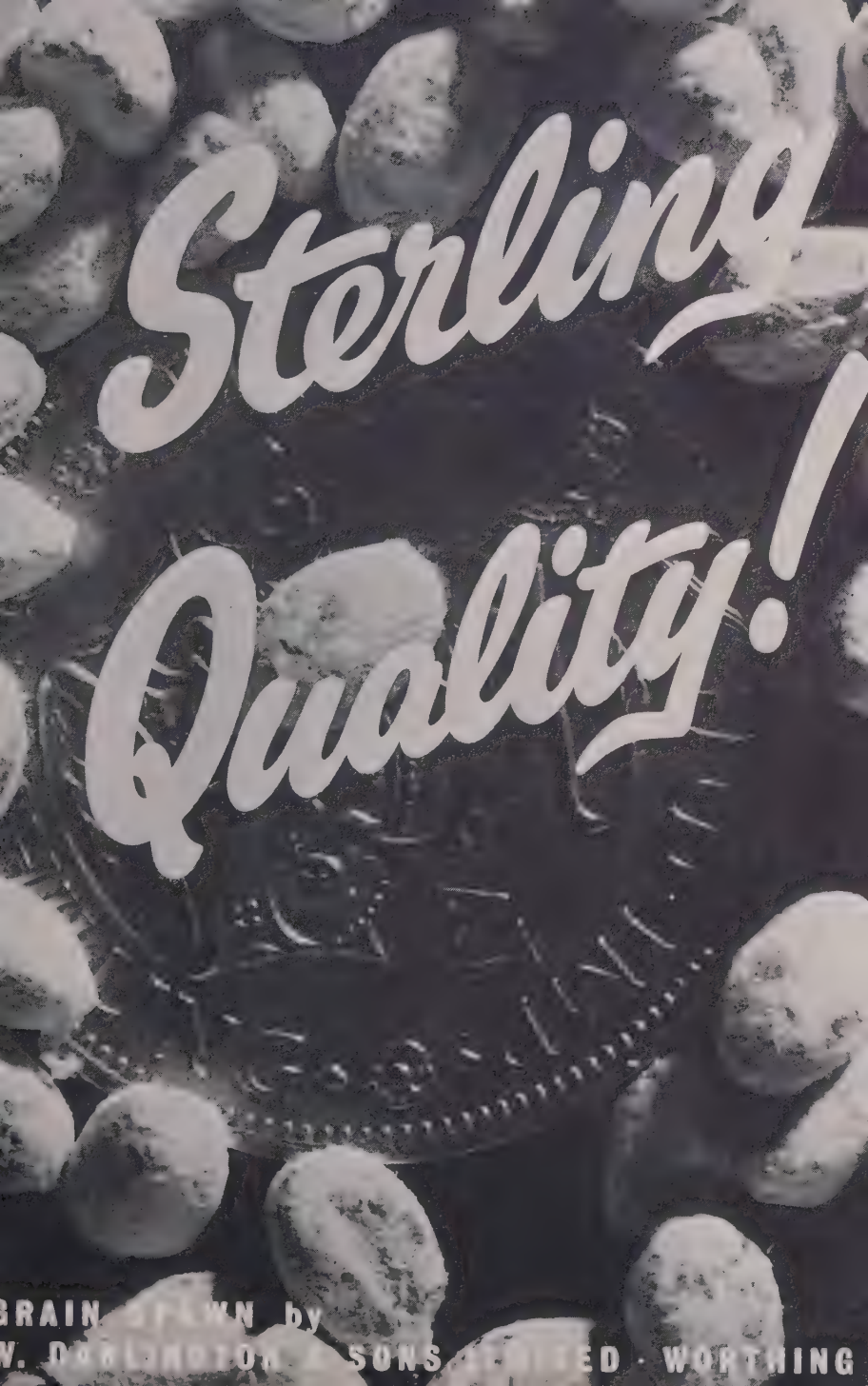
Phorids

Growers undoubtedly spend more money in attempting to control these flies than any others, presumably because they are the most obvious and hence cause alarm when present in any numbers. A great deal of confusion still exists regarding the identity of the species involved. The differences between *Megaselia nigra* and *M. halterata* must, therefore, be re-emphasised. Hussey (1960) has contrasted the structure and behaviour of the mushroom-infesting species of Phoridae, but in practice the grower can base his control programme merely on the type of damage caused. *M. nigra*, the species which used to affect the industry in the pre-war days when more mushrooms were grown on

outdoor beds, lays its eggs on the developing sporophore. The adult apparently only lays eggs on beds lit by natural daylight and damage is therefore concentrated around doors or windows. The larvae tunnel extensively in the stalks and caps. To give insecticidal protection to the developing mushroom is scarcely practical as the pest is most serious in warm weather when the doors have to be kept open to increase ventilation. Space sprays would not persist long enough to reduce oviposition and vaporisers would not be efficient in open houses. Control may be possible if a sufficiently low residue is found to repel the ovipositing female without infringing safety requirements for the consumer. But, in the meantime, control is best achieved by ensuring that natural daylight is excluded from the beds in warm weather by installing adequate ventilation systems. The other species, *M. halterata*, attacks the mycelium within the compost and never tunnels in the sporophore itself. The species is strongly attracted to rapidly growing spawn and is therefore a threat to spawn-running rooms. Indeed it may complete a generation before casing, in the temperatures prevailing there. Efficient filters on the ventilating system and complete sealing of the structure are essential if spawn is to run safely.

The difficulties which have been encountered in the control of *M. halterata* have led to suggestions that resistance to insecticides is developing but, although no tests have been made to check for resistance, it appears more probable that the control difficulties are apparent rather than real. Limited tests at G.C.R.I. have shown that many atomizing concentrates give a high knock-down but the continual emergence of fresh adults from the beds, together with immigration from outside, results in a high population a few hours after applying an insecticide. Observations made here suggest that once mycelium has run through the compost vast populations can be present without affecting cropping. Adult Phorids are often said to carry bacterial blotch but experiments on the artificial transmission of this disorder suggest that it cannot be mechanically carried from mushroom to mushroom. We believe that large numbers of these flies are not serious except perhaps as a nuisance to cultural operations! It is also evident that insecticides used against these aerial populations give no crop value return for money spent on control methods. On the other hand if large-scale oviposition occurs soon after spawning, complete loss of spawn can occur before it has colonised the compost. The scale of this attack must be enormous as observations suggest that a concentration of Phorid eggs in excess of 10 per *grain* of spawn is necessary to impair mycelial growth!! Our contention is, therefore, that almost all the insecticidal effort should be concentrated on the period between spawning and casing.

If your spawn-running room is fly-proof then hardly any insecticidal expense is justified. In the absence of such facilities (in the summer months) the most promising deterrent to oviposition seems to be synergised pyrethrin dust applied at 1 lb/1,000 sq. ft. costing about 7/-. It may also be valuable to use fumigant vapourisers during this period for about eight hours on each of the first fourteen days of



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spawn-run. The cost of such a control would be about 62/-. These methods should ensure a Phorid-free compost at casing, and as the flies take four weeks to develop at normal cropping temperatures, the first generation would not appear until cropping had commenced. Thereafter only occasional controls would be required in exceptional circumstances. The control expense is an insurance for the entire crop representing an outlay of 31/- per £100 of crop value.

Sciarids

We can be less emphatic about the importance of Sciarids in the economy of mushroom production for, in our own houses, we often have vast populations of these flies without experiencing much loss from the black-headed larvae tunnelling in the sporophores. These insects lay their eggs on the casing surface and the newly hatched larvae occasionally tunnelled up into the stipes from below. There is little doubt that the use of Aldrin in the casing, primarily against Cecids, would deter Sciarids as well without additional expense.

Summary of Control Methods

We suggest that almost the whole insecticidal campaign should be directed to the bed surface in the period up to casing. The newly spawned compost should either be kept in a fly-proof spawn-running room or, in the summer months, dusted with synergised pyrethrin and possibly maintained in an atmosphere of vaporised BHC. The casing should be prepared so as to contain 10 p.p.m. Aldrin. Use of space sprays etc. should be restricted to reducing aerial populations which are causing discomfort to workers.

Considerations in the use of Aerial Insecticides

It is important to consider the development of insecticide resistance following the continued use of control methods. In the case of Cecids the genetic constitution is such that the development of resistance seems most unlikely but with Phorids and Sciarids it would be theoretically possible. It is often advocated that sprays should be alternated so as to reduce the selection pressure for individual compounds but in practice this often only results in resistance to both materials. The best evidence available at the moment suggests that the same material should be used until resistance develops (this must be checked experimentally) and then a change made to compounds from a different chemical group. For the moment growers need only consider the two important groups of insecticides, chlorinated hydrocarbons (DDT, BHC and Aldrin) and organo-phosphorus compounds (malathion and diazinon).

Should very large aerial populations of flies have to be cleared growers usually make use of atomizing concentrates. The cost of DDT or BHC is only about 6d. compared with 1 6d. for organo-phosphorus materials so that they are obviously the cheapest control until, and if, resistance develops. These sprays have to be made up and applied with fairly expensive machinery and we calculate the cost of application at 2/-/1,000 sq. ft. (including depreciation). Smokes and low-pressure

aerosols require no equipment and the labour costs of application are negligible. The former would cost about 3/- compared with as little as 8d. (pyrethrin) or 1/5d. (malathion) in the case of aerosol canisters. Vaporisers used to control flies in this way would cost considerably more than smokes as they would have to be run for several hours at about 1/- per hour.

Conclusions

We have attempted to stress the importance of establishing the economic benefit to be gained from expenditure on pest control and conclude that money is best spent in the form of an insurance rather than haphazard use of sprays during cropping. Our experience has tended to make us move away from the use of insecticides incorporated in compost owing to the danger of affecting cropping. The apparent low cost of aerosols is perhaps surprising but undoubtedly worthy of consideration by the grower who has not yet invested in spraying machines.

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Q. : Mr. R. Thompson : What is the effective life of synergised pyrethrin?

Dr. Hussey : Well, that's a bit tricky. We can't tell you the answer straightly but in practice we've found two things. First of all, we imagined, like every one else that pyrethrin had a very short life and when we did experiments against cecids, in quite a different connection, we were surprised to find a build-up of pyrethrin occurring when we applied it at weekly intervals, which suggested that it was taking longer than a week to break down. Since doing that there have been papers published showing that the principal factor in breaking down pyrethrin is light, a sort of photo breakdown is involved, and since most mushroom houses are dark it may have a much longer life than you think. The experiment that I carried out, preventing phorid ovi-position in newly spawned blocks of compost, only used one application of pyrethrin. The analysis of the results was made after one week's exposure so I have no real practical experience at the moment other than

what one dose would do. If we can get suitable people to co-operate, what we've got to have here are suitable fly-infested farms where we can carry experiments out. Although we get every encouragement at Toddington it's really not a big enough unit to get the vast fly population building up and, in practice, if we could do these things on a field scale we might find that two applications in the spawn running room might be better, but at the moment I think one would do.

Dr. Chapman : Have you any information on the repellent value of these materials?

A. : A year or two ago I had rather high hopes that the use of repellants against mushroom flies might be more promising than controlling them. Time has modified that opinion and the experiments that we did using repellents, as such, were not too happy. We did get some effect ; you could find for instance that DMP, the ordinary thing used in domestic repellents, creams and so on, when put around houses and doors didn't work effectively enough and I don't think that the repellent action of insecticides would really be effective.

Mr. Stanley-Evans : Is a very heavy dusting of B.H.C., which is common practice in the mushroom industry, a waste of time in your opinion?

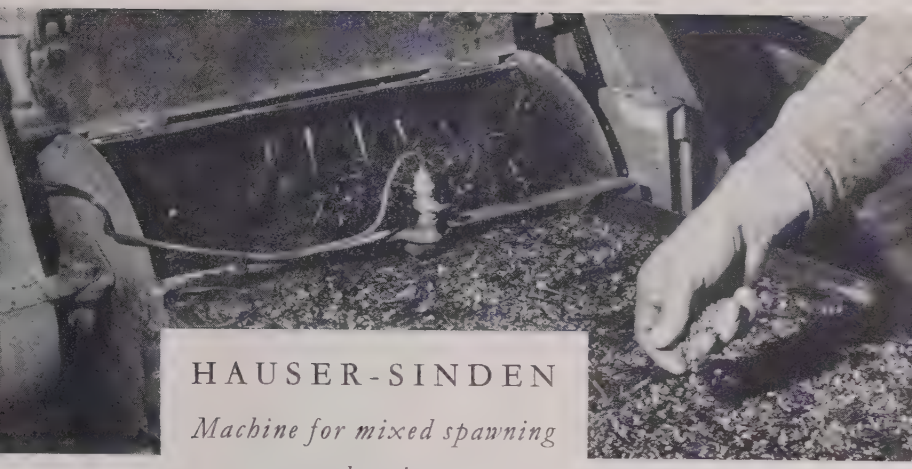
A. : Well, time again may prove me wrong but at the moment I say ' yes '. Our experiments have shown that B.H.C. and Malathion are quite useless against phorids and on the whole we get far more phorid eggs when we use these materials than when we don't. That is contrary to the work of Moreton some years ago. I can't quite understand why it is, although in conversation he did mention that he got similar results sometimes. We have no evidence at all that B.H.C. is any use against phorids. I've dusted until the flies going in passed through $\frac{1}{4}''$ thick dust and there still have been 500 eggs to the gram (*laughter*).

Mr. Mathews : Can the concentration of Aldrin be overdone?

A. : You can overdo any insecticide. There's no doubt about that. In fact that's why we've moved right away from trying to put insecticides in compost. There are levels at which you can do it without getting crop loss.

Mr. Jones : Is there any possibility of taint to the crop by overdoing the concentration?

A. : You have to consider two different things here : we have no evidence at all (and presumably the palates of the staff at Littlehampton are average) that there's any taint in terms of taste from the use of any of these materials applied to the casing or the compost at any time. The danger of take-up remains. So far the residue analyses that have been made have not shown the aldrin to be taken up at these levels. Because we are becoming more conscious of this problem we may find some but I don't think that there is any possibility that aldrin



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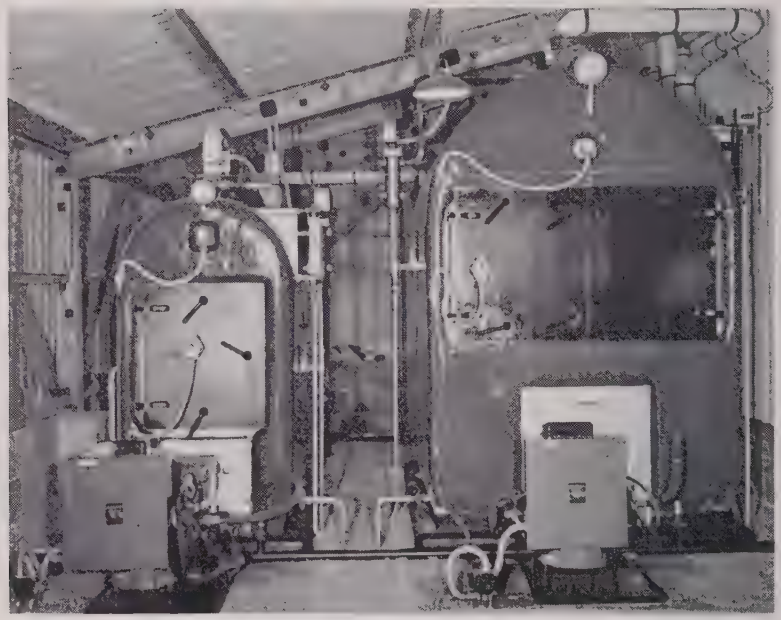

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applied to the bed surface before you get pinheads ever causes trouble. I think the main trouble with insecticides is when people use them during cropping and there are some pretty lethal things applied on many farms. I think late dusting with D.D.T. and B.H.C. would probably give you quite high residues but not if you only apply before you actually get pinheads.

Mr. Hewett : Is it safe to add several of these things together ; for instance Vantock AL was suggested yesterday in another context? Is that compatible with aldrin?

A. : I'm afraid I can't answer that one. I was as interested as probably most other people were to hear about the use of Vantock yesterday. I'm afraid it's a thing that's got to be found out. On the whole I think one would have to go a bit easy about that. I don't think I would ever mix two things together without having some published proof that it was safe. We shall test this Vantock AL idea and shall run the two together.

ALDRIN: Dr. Hussey has since written: **" Growers will remember that last November the MGA urged caution in the use of Aldrin until further information on the residues in mushrooms was available. The latest picture is that if Aldrin is incorporated at 10 p.p.m. in the casing material** *before* **application to the beds, there is almost no chemically detectable residue in the picked mushrooms. However experience has shown that the method, while being satisfactory for the orange** *Mycophila* **larvae, is not so efficient against** *Heteropeza*. **We suggest therefore that the only practical step growers can take against the latter species, in the present state of knowledge, is to mix BHC in the compost during preparation at 50 p.p.m. (2¼ lb. 5% BHC/ton compost). It should of course be remembered that BHC may subsequently cause some taint if the spent compost is used on horticultural crops".**

WATCH THOSE QUALIFICATIONS

Warning from Danish Research Station

Mr. C. Riber Rasmussen, head of mushroom research in Denmark, writes as follows :—

The Danish Mushroom Research Station regularly employs volunteers—including some from abroad—for a certain period of time not exceeding a maximum of one year. The volunteer student gets every opportunity to follow and take part in the work. Among the students are some who, by hard work and ready application obtain the maximum benefit, depending on their own ability. Such people, who have proved satisfactory and who are deemed to be sufficiently qualified, receive a written recommendation signed by the director of research. Others, who for one reason or another are not considered to be suitably qualified, do not receive such a letter.

This information is published because it has come to the knowledge of the Research Station that some former students, without the letter of recommendation, nevertheless contact mushroom growers, established

or beginners, and (a) endeavour to obtain employment on the strength of their brief stay at the research station and (b) endeavour also to obtain salaries far above their ability.

It is as well to remember that the only volunteer students who have satisfied the Danish Research Station are given the letter of recommendation already referred to.

MUSHROOMS "NOT A LUXURY"

When it was suggested, in a case at Southport (Lancs.) County Court that mushrooms were a luxury Judge Harold Brown commented: " Mushrooms are not a luxury." The case concerned a married woman's alleged debt regarding provisions.

Calypso

BUILDING COOLING-ROOMS? HOW & WHY

Dear Winston Alderton your letter dated
July the Eighth prompts this reply belated ;
You must have thought long since that I was fooling
Around the vital task of mushroom cooling ;
But really Sir, believing me, I'm sure will
Appreciate my hesitance, until
I'd probed the pros and cons from every source
Enabling me to write with factful force.

Herein I trace in humble lines of verse,
A scheme which could eventually disperse
Our major ill (that 'blotch' disease on sales)—
The Monday glut—and all that it entails.
The one big aim in cooling mush' at source
Is to remove field-heat ere they get worse,
And add to this by holding back the *best*,
To ship by Thursday night with *all* the rest,
Though inadvisable to hold a host
For more than two or *three days at the most ;*
And *forty* seems to be the temperature
Which best the tender tissue can endure,
And speaking of this soft and tender tissue
Raises, perhaps, the most important issue—
Since juicy caps discolour fast if bled
'*Great care in handling*' must be labelled red!
Select, where free access, a central site
With handy loading ramp at van-floor height,
And for assembly build a still-air room
Around the door of that cold inner tomb,
And, for quick transfer, hand-truck pallets use,
Whilst fitting of door-saddles quite refuse.
Let's end this rubbish dumping on the markets
And launch us all afloat on Magic Carpets!
God speed that day that ushers in the boom,
With universal quality in mushroom!
And thus eliminate the stacks of flats
Which must be sold post-haste as mere lump-lots,
And (more than meets the eye) inedible
Do an injustice quite indelible—
A curse to all!—the which will meet its doom,
When every grower builds a cooling-room!

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Weston-Super-Mare, October, 1960.

COMPOSTING BY ANALYSIS

V. L. BARROW, B.Sc. (Agric.), N.D.A.

Managing Director, Shirley Organics Ltd.

Summary: The purpose of this paper is to explain the advantages of analyses made and the using of relatively simple scientific instruments to help in the control of composting. Details are given of analyses made, their importance and effect on cropping under commercial growing conditions. These analyses are not restricted to the compost pile but include atmosphere, especially during peak heating.

Since the war the wholesale prices of mushrooms have declined by 60—70% and the cost of materials and labour have increased by an average of between 50 and 100%. Stable manure has in fact increased by a greater percentage. These figures were given me by a grower who, despite them, is still growing and making a good profit. There are very few industries that have been called upon to increase their productivity so much in such a short period of time.

My own first look at commercial mushroom growing was in early 1946 when I was still in uniform. A gentleman took me over his flourishing farm then but he is no longer a mushroom grower. If he was to visit some of the modern growing plants in this country—as I am pleased to say I have the privilege of visiting—he would hardly recognise them as mushroom farms. The change from his own effort, that in 1946 enabled him to live very well, is so marked. He is not the only one to leave the industry—some have left voluntarily, others unfortunately under the hammer, yet there are many who have entered it. Far more mushrooms are grown now than ever and the relative prosperity in the industry is as good, if not better, than in any other branch of horticulture. It is therefore obvious that the challenge of higher productivity to meet lower selling prices has generally been accepted. It is probably true to say that many have met it by simply increasing their area cultivated, but with the majority it has no doubt been a combination of this and an increase in production per square foot.

It was in the late nineteen forties that Mr. Atkins and Dr. Edwards invited me to make the new activator then known as A, B and C and later as MRA No. 1 and MRA No. 2. To this day I am still responsible for making MRA Activators to the original formulae and there are still some growers using the methods of composting they used ten years ago. From a growing point of view they must represent a much smaller percentage of the total area than they did in 1950. Undoubtedly the increase in productivity has, in most cases, been associated with an improvement in composts and methods of composting.

I think it significant that very few of the long standing growers appear to remember the exact methods they were using only a few years ago. Some become nostalgic about the crops of 3 lb. and over that they had in the old days and now claim they never have. But surely it is true that these crops were often the result of from 14—26 weeks cropping and that anyone producing 6—8 lb. per square foot per annum was rated an outstanding grower. We now know that if a

grower wanted to crop for 26 weeks he could produce up to and sometimes over 6 lb. per square foot or, expressed in a different way, a ton of mushrooms from a ton of straw. In fact a friend of mine is producing at the rate of 18 lb. per square foot per annum and there are others doing from 12 lb. upwards. These growers have something in common although at first glance it may not be obvious. Some of the basic methods of these successful growers are quite different for they include shelf and tray growers and users of stable manure and synthetic composts. (Incidentally I much prefer to describe these as straw composts). But they do follow along the same lines in their methods of handling their composts.

It was in Brussels in 1953 that Dr. Sinden threw the proverbial spanner into the composting works and I hope that he will forgive me for this comment on an excellent paper. I am sure there are very few here to-day who have not read the description of his methods as published in " Mushroom Science 2 ". There can be very few who have not tried to emulate them and with varying results. The first attempt I saw was a complete failure. As it was done by an experienced grower I was undoubtedly influenced at the time. Some growers were successful but it did appear to the onlooker in 1954 that it might be, if not a seven day wonder, then certainly a 12 to 14 day one.

Even on first reading of the description of this method it is very obvious that, at all stages of composting, there are many limiting factors and to be successful there must be considerable analyses done and various scientific instruments used. For instance in the first 160 lines in the description temperature is mentioned no less than 16 times. It is also stated that ammonia must be released; that the nitrogen content of the compost must be not less than 1.5% of the dry matter in it; that the oxygen content of the atmosphere in the compost pile must be not less than 2% and that in the peak heat house between 15 and 20%. It is really as a result of a study of these figures that this paper has its title.

Over six years ago I made an offer to several growers. It was to analyse their composts from the time of assembly until the end of cropping. To say it was a success would be futile. One or two growers showed initial interest, others none at all. I do not blame them at all for this scheme was far too ambitious. Most growers certainly considered that it took far too much of their time. This you can well imagine for it meant taking representative samples almost weekly and keeping accurate records of cropping and growing conditions, etc. Another factor was the cost. At that time I did not have the excellent laboratory at my disposal that has been available for the past three years. All samples had to be sent to a public analyst with the resultant delays and expense.

So a much simpler and more practical scheme was started. This could not have the exactness of the original scheme nor that required by a research scientist. But I hoped that by repetition and the taking of samples of composts from a wide range of growers it could give me the information that we, as manufacturers of mushroom compost supplements, needed and be of positive value to the grower. Moisture, nitrogen

and pH values appeared to present the least difficulty and all are considered to be controlling factors in mushroom growing. The difficulties encountered by most people in taking a truly representative sample of compost at the time of stacking were a real problem.

Consequently whenever a grower wished to take advantage of our analysis service we suggested that the samples of compost be taken at the end of peak heating and prior to spawning. In other words we tested the compost on which the mushrooms were to be grown. The normal procedure is to take samples from various parts of the house—a total weight of about two pounds. This is then packed in a polythene bag, or other moisture proof container, and sent direct to the laboratory. Here it is mechanically mixed and sampled for firstly a pH test, then another sample is tested for moisture content, using the five hour method. The sample used for nitrogen determination is not dried and the result therefore is given on the compost as received and then calculated to the percentage of nitrogen in the dry matter.

During the time this scheme has been in operation a very large number of tests on growers composts have been made and a pattern now shows which I feel is of interest and value to growers. The results are shown in the following table:—

	% Moisture	% Nitrogen in dry matter	pH
Highest	79.5	3.9	7.4
Lowest	53.0	1.8	6.3
Average	69.3	2.6	6.7

SMALL ADVERTISEMENTS

(*Contd. on page 180*)

FOR SALE: Two hotwater boilers, 300,000 b.t.u. One steam boiler with pipes; Turning machine, elevator, tipper lorry and other sundry items of mushroom farm equipment including asbestos corrugated sheeting, 60′ × 20′. London area. Box 4.

BOILERS AND PIPES FOR SALE. Spencer Hopwood No. 18 Vertical Oil-fired Steam Boiler, complete Unit, Oil Tank, etc. Also Fuel Oil Tanks, 2,300; 1,250 and 750 gallon. Gravity Conveyors, Rollers 18″ and 14″ wide with Curves and Stands. Benford Petrol-driven Wheelbarrow. Several Motorised Fan Blowers 2″ 7″ delivery. A. H. KIMMINS & SONS, LTD., Lyndhurst Road, Worthing.

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It must be realised that these are the results from testing composts at the end of composting. We have done many others, of course, including samples taken during composting and the beginning of peak heat with further tests done on samples from the same trays at the end of it.

In commenting on these results it may interest you to know that in the case of moisture content 64% of the tests were above average; nitrogen showed only 45% above average and pH showed 39% exactly as the average. The least reliable of these tests was undoubtedly that of the pH. As a sample may be 36—48 hours before it is tested a variation may take place. As it is so easy for a grower to take a pH reading I suggest that he should do it on the spot. The materials needed are cheap and the test is a simple one.

Unless the compost is packed immediately in a watertight container there may be a moisture loss so the very low readings should possibly be discarded and then the average becomes 70%.

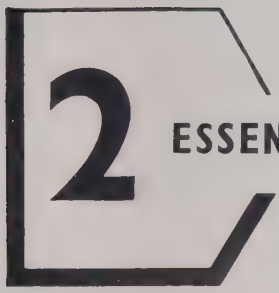
Independent experiments have shown an average loss of dry matter is about 33% during composting.

However this can vary from 30—40% according to the methods of composting and the type of activator or supplement used. The inorganic type of activator results in the largest loss during composting. The figures for the percentage of nitrogen in the compost at this stage may appear to be very high but the loss of dry matter during composting is responsible for this. The figures for nitrogen in the dry matter at the start of composting are much lower. If for instance we translated the nitrogen, by purely allowing for the loss in dry matter, the figures would read as follows:—

	% Nitrogen in dry matter	
	30% loss	40% loss
Highest	2.69	2.3
Lowest	1.26	1.08
Average	1.83	1.57

This of course does not make any allowance for nitrogen, in the form of ammonia, lost during composting. If we had the figures at the start and knew the loss of dry matter we would be able to have more accurate calculations. We have only three tests which give us a lead on this, all had over 2% Nitrogen at the start and finished between 2.9 and 3.1. The loss of dry matter was averaged at 35% and a loss during composting of 0.2% nitrogen. We of course know that the release of ammonia during composting varies considerably and is higher with those nitrogenous materials that are more quickly broken down.

Nevertheless it is fairly obvious that a large percentage of the tests taken were of composts that, at the assembly of the materials for composting, must have contained below the 1.5% nitrogen suggested as a



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minimum by Dr. Sinden and many were above the 2% he considered the maximum. It may surprise you to learn that the crop resulting from the highest nitrogen test compost exceeded 4 lb. In the case of many growers we ran a long series of tests — up to 20 on one farm — but on others only a few were taken and on some a single test. It may occur to you that the tests were only taken on samples from farms of our own customers but this is not true, although it is so in the majority of cases. I do, of course, know the names and methods of composting in practically all the tests but I assure growers that I have not the slightest intention of disclosing their names without permission. It is certainly true that most of the above average samples did come from growers using supplements—the lowest were from farms using straight racing stable manure or an insignificant amount of supplement.

How much nitrogen can a compost contain and what effect does it have on cropping. I can state definitely that the best cropping farms I know are those with the high nitrogen and high moisture (around the 70% mark) in their composts. In fact from 2—2.4% nitrogen is usual. With the very wide variations in stable manure it is difficult to make a nitrogen estimate from appearance alone. The difficulty of accurately sampling at the time of stacking certainly adds to the speculation. Yet where tests have been done on a series of samples taken on the same farm there has been an amazing regularity in the percentage of nitrogen in the dry matter at the end of composting. Also where additional supplements have been recommended these have been reflected in later tests. With a straw compost it is fairly easy to forecast the analysis at the time of the first turn. Composts of this type with an analysis of about 2.4% nitrogen have produced crops of 4—5½ lb. In fact, if the average alnaysis of straw given in the textbooks is accepted as being 0.6% nitrogen, than a properly made compost using the MRA activator to their recommendations should analyse just over 2%.

Worked out by the same method the straw compost of the grower cropping at the 18 lb. per year rate gives a much higher analysis and in fact, after an unusually high ammonia release, it still averages around the 3% mark after peak heat.

A factor that many growers possibly never think about is the variation in the analysis of straw. At the time of preparation of this paper tests are proceeding with three different wheat straws the nitrogen content, on a basis of dry matter, being 0.38%, 0.42% and 0.71% respectively. The analysis of a straw compost made from these straws may vary as much as 0.22% nitrogen from the straw with the highest and lowest nitrogen contents.

This variation in straw of course affects the analysis of stable manure. One big advantage the straw compost has is the fact that the straw can be tested before the time the grower starts his compost and adjustments may be made if found necessary.

What is the significance of free ammonia? To deliberately lose plant food seems on the face of it a waste, especially when it is known that good crops have certainly been grown without any known loss. Tests

have shown that when cropping over a long period it made little difference to the total yield. Its significance appears to be in the fact that if free ammonia is released late in composting then the earlier flushes yield better than they do on a compost where the ammonia loss is early or not at all. In the latter case the effect on cropping can be corrected by a planned ammonia release from the casing material before use. Full details of the experiments on this can be read in the paper given by Dr. Chapman at Copenhagen.

He describes this as the ammonia factor. Free ammonia also plays a part in the growth of actinomycetes, which most growers like to see, during the early and also during the conditioning phase of composting.

At this point I must say that I have been very fortunate in having the invaluable help of Dr. Chapman, a scientist who is responsible for several notable discoveries in agriculture. He has done considerable laboratory work in addition to growing tests.

Earlier I mentioned the number of times temperature was mentioned in the write-up on the methods of Dr. Sinden. Unfortunately these were given in Centigrade and at this time I would suggest that in any articles written for the benefit of British growers Fahrenheit should be used. During preliminary composting it is suggested that the temperature should exceed 167° F. in order that chemical reactions can take place when the biological activity diminishes. I know successful growers who make every effort to avoid compost temperatures exceeding 165° F. This can be difficult and sometimes requires more turns than usual which in itself can be difficult on the farm operating on a definite schedule. But at least the frequent turns do result in a compost that is uniform and this is obviously very important.

Possibly the greatest change in composting methods during the last ten years has been in the peak heat house. In fact I often think that this name should be dropped and the more accurate description of conditioning house used. I am sure it is true to say that very few growers to-day restrict the time spent in this house to the 12—36 hours so common a practice only a few years ago. It is also true to say that there is possibly a greater difference of opinion among growers on how long this process should take than on any other phase of composting. Much depends on the condition of the compost when it is filled, but I suppose it is true that a good average with successful growers is 4—5 days. Temperature control is obviously important but so also are insulation, air movement and the percentage of oxygen in the atmosphere. It is almost impossible for the shelf grower to obtain the prescribed conditions in a growing house. Consequently many who still prefer shelves for growing have resorted to trays for the conditioning part of their composting. Since Mr. Rasmussen explained the advantages that may be obtained from shake-up spawning the shelf grower who uses this method can also do his spawn run in the trays, shake-up and then fill his beds. As a result these are filled for only a few days before casing. This system does make it possible for the shelf grower to produce his 4 or more crops per annum. On the other hand with the introduction

of mechanical aids, such as fork lift trucks, larger trays can be used and by open stacking in the growing house the tray grower can obtain the advantages claimed by the shelf grower.

Although this may appear to be digressing from my subject it does explain why and how all growers can use a purpose built conditioning house. The maximum temperature in this house can be twice as high as that in a growing house, with humidity up to 100% even at the high temperatures and usually much more air movement. Therefore it is essential to have first-class insulation, sealing of the inside surfaces and specially constructed fans. Foliac pastes and paints have solved the sealing problem and the other necessary insulating materials and fans are now available.

Uniformity in the compost and the handling of it is just as important as in the first phase and it is here I feel sure that many growers have had failures. The carbon dioxide and ammonia produced during this further period of conditioning must be removed from the bed surfaces as they are produced. Whereas the gross volume of a growing house will normally be in a ratio of four or five times that of the growing area—e.g., 4 or 5,000 cubic feet volume to 1,000 sq. ft. of bed area—the ratio in the conditioning house will usually be between 2 and 3 to 1 according to the depth of the trays. So air movement may be at a rate equivalent to 10 or even 20 times the volume of the house. For example a house of 3,000 cubic feet volume should have a fan capable of moving possibly 40,000 cubic feet an hour. This of course after allowing for the back pressure caused by the ducting. This is essential in order to keep the air moving over the surfaces of *all* the trays, otherwise conditions in the house will vary and the uniformity aimed at will not be realised. Next is the control of the oxygen. During the conditioning this is removed from the air and replaced by carbon dioxide and ammonia. At the temperatures normally used and in the presence of air, with its full quota of approximately 20% of oxygen, actinomycetes will rapidly develop and considerable ammonia will be released. Consequently during the first 24—36 hours it is usual to combine air movement within the house with external ventilation. But some growers have proved, by larger yields, that actinomycete growth should be restrained. The easiest way to do this is to restrict the oxygen supplies by cutting off the supply of external air while maintaining internal circulation. Consequently some simple way of accurately measuring this oxygen content of the atmosphere is essential. At the Folkestone show last year I introduced an accurate but inexpensive instrument for this purpose. Although it is accurate to within $\frac{1}{2}$% oxygen and I was sure it was ideal for the purpose I did not really expect every grower in the Country to immediately discard his candles and lamps. However many growers did do this and now we have the example of a grower who has no need to enter his conditioning house from the start to finish of its operation. By taking daily tests often several a day—he can observe the percentage of oxygen decrease until, when it is 12% on about the fourth day, he knows that this phase is completed. He can then turn on his

heat for the kill—up to the 140° F. pasteurisation temperature—and open up his full ventilation to cool off quickly for spawning.

I have mentioned the variation of time spent on conditioning by different growers. I feel I should now mention some growers have restricted the preliminaries to stacking and watering followed by only one turn before filling. A longer period of conditioning follows and the compost rises to a higher temperature than normally considered the maximum. These conditions and especially in conjunction with a high nitrogen content are considered to encourage the development of chaetomium. The risk of this appears to be reduced by keeping the compost in the conditioning house for a longer period and finishing with three of four days at 135—140° F. followed by a good shake-up before spawning and the use of gypsum at the same time.

One of the most obvious reasons for a series of controls, such as I have given, apart from the better yields obtained, is the fact that it is made much easier to repeat crop performances. There is also the case of the grower who used to do everything himself and with his own "know-how" had good crops. Now as a result of his expansion he finds he often has to leave these operations to other members of his staff. By charting other items than the daily pick he is able to build up a balanced production schedule suitable to his own particular conditions.

May I suggest also that a higher yield is cheaper than expansion of area and that to me it does appear more logical to attain this before undertaking physical expansion.

In conclusion I should like to emphasize the following points :

1. Tests show that most growers have little difficulty in maintaining a compost containing 70% moisture.
2. A properly made compost appears to have a pH value of 6.7—7.0 and most tests show that growers have this at the end of composting.
3. Nitrogen is a controlling factor in yields and its variation in the content of composts is considerable—more growers are below average than above it and a large proportion are below the 1.5% minimum suggested by Dr. Sinden. In detailed examination of the results of the long list of tests done there appears to be a gap between the 1.6% and 1.8% mark with known large croppers on or above 1.8% and in many cases over the 2% mark.
4. It does not appear essential to have an early compost temperature over 170° F. These temperatures should be taken, incidentally, at a distance of about 18" from the base of the stack.
5. Frequent turning during the first phase of composting ensures better uniformity. During conditioning, control of air movement and its oxygen content insures a more uniform finished compost.
6. Tests in some composts were actually made on phosphate and potash content but not in sufficient cases to include in this paper.

It has been proved that potash can be considered a minor element and that fairly small quantities can be responsible for reduced yields. Materials of high potash content used as supplements may often have had this effect. I know growers who have had this experience and have now discontinued or considerably reduced their use. Experiments with phosphates are being done at the present time. Phosphorus is considered by many as a major element in mushroom production.

7. Growing conditions have not been mentioned as they obviously do not come under the heading of composts. But it does stand to reason that unless these are good then yields from the finest of composts will not come up to the figures given earlier.

8. The use of straw or so-called synthetic composts though still not common must increase in the future. A grower can control them better and high yields can be more consistently maintained. With the particular type I am interested in they can be successfully short composted and consequently used by a grower on a strict schedule. They may even be interspersed among stable manure composts at regular or irregular intervals.

9. This paper has been written to be of practical value to the commercial grower and I hope that it has been of interest to you.

Question : Would it not have been better to take samples of manure on arrival and then supplement, if necessary, according to the results of test?

Answer : The two main reasons why this was not done were : (*a*) that it is very difficult to take a representative sample at this stage and (*b*) the length of time taken to sample, mail, analyse and get the results back to the grower is too long to allow for addition of supplements, especially for the grower on a 6-8 day outside composting schedule. In the case of a large grower with his own laboratory and trained analyst, it could be of practical value as these tests can be easily completed within a day. On the other hand it is easier to take a sample just prior to spawning, and our figures show that when a series has been done on a farm the results are remarkably constant.

Q. : Have you any specific crop figures in relation to nitrogen content?

A. : Unfortunately not all growers have passed this information on to us, but in cases where a series has been done we have had some interesting figures. On one farm 1.5 % N. gave a crop of 1.15 lbs., while 2.78% gave 2.6 lbs.; on another, analyses of 2.7 gives consistent crops of 2.5—2.75 lbs ; another average yield was 1 1.25 lbs. with analyses of 1.5 1.7% N. After supplementing to give 2.2 2.5% N., crops increased by .4 to .6 lbs.

Q. : What is the effect of too much nitrogen?

A. : There have been a few crop failures where the nitrogen was 3.2% to 3.4%. In these cases *Chaetomium* was responsible.

Q. : Do you think that there is any relation between the nitrogen content and *Chaetomium.*

A. : As a result of above, tests have been made where excessive nitrogen was added deliberately and in practically every instance *Chaetomium* resulted.

Q. : Are the figures for oxygen during peak heat your recommendation?

A. : The whole of the paper is a factual recording of statistics, and the percentages of oxygen given are those proved satisfactory by a successful grower. However, composting varies from farm to farm and I suggest that each grower should keep a record of tests—both compost and atmosphere—until he finds the conditions which give the best crops. Growers who have done this have certainly improved their crops ; also, without good hygiene and cultural methods the finest compost in the world may give poor results.

EXECUTIVE COMMITTEE MATTERS

The MGA Rules were among matters discussed at the last meeting of the Executive Committee prior to the A.G.M., and it was agreed that a complete revision was necessary. Mr. F. C. Atkins and the Secretary are to consult with the NFU on the matter as the MGA Rules are subject to the over-riding rules of NFU Headquarters.

Compost Analysis: The proposed compost analysis scheme was discussed and Dr. R. L. Edwards reported that the analysis of compost from his own farm, by three separate analysts, showed an unexpected variation. It was unanimously agreed that further investigations should be made before the scheme was launched and the Committee agreed to finance these further investigations, up to a maximum of 150 guineas.

Oil Scheme: It was reported by the Secretary that the Oil Scheme continued to work smoothly and further progress with the scheme as a whole was anticipated. Members felt that a further meeting with Esso Petroleum representatives was desirable on the grounds that some of the larger growers, still outside the scheme, might be persuaded to join in.

Area Election Voting: A suggestion was put forward that, in Area Elections for seats on the Executive Committee, the number of votes available to Grower Members should be determined, pro rata, on the size of farms. After some discussion the Committee decided to take no action on the matter.

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EXECUTIVE COMMITTEE MATTERS—*continued*

Fertilizer Subsidy: The Chairman reported that hopes that the subsidy on fertilizers would be made available to mushroom growers, without the proviso that the used compost must be spread on the growers' own land, had received a slight set-back. The case put up by the MGA through the NFU had been recognised as sound but the Ministry had not been able, as was originally hoped, to include the new proposals in the 1961 programme but it was expected that it would be in the 1962 programme. It was agreed that enquiries should be made with a view to expediting the matter.

Thanks: Thanks were expressed to Mr. F. C. Atkins and Mr. E. G. Gook who, after six years unbroken service, were not eligible for re-election to the Committee, the ruling being that all such members must retire from the Committee for a complete year.

NEW LEAFLET NOW AVAILABLE

Mushroom Pathogens, Weed Moulds, Indicator Moulds and Competitors

Members will recall that, in 1959, *The MGA Bulletin* carried a series of articles by Dr. Leon R. Kneebone and Mr. E. Merek of the U.S.A., on "Mushroom Pathogens, Weed Moulds, Indicator Moulds and Competitors".

The articles created a great deal of interest and the complete set, in booklet form, is now available from the MGA office at a cost of 5 - each. Only a limited number have been printed and early application is advisable.

ANNUAL MEETING AND ANNUAL LUNCH

Because of the considerable amount of work entailed it has not been possible to include in this issue a report of the Annual General Meeting and the Annual Lunch, which took place at The Park Lane Hotel, on Tuesday, 22nd March, but a full report, together with the accounts and a page of pictures, will be appearing in the May issue of *The Bulletin*.

FANCY THAT!

The MGA Secretary recently visited Wormwood Scrubs where a prisoner, due to be released about two months later, was proposing to become a commercial mushroom grower.

"MONTY" TRANSFERS AVAILABLE SOON

A new symbol " Monty " Mushroom, similar in purpose to the " Mr. Cubes " and the " Mr. Therms " of this world, was launched last month in connection with the establishing of a Mushroom Information Bureau and, in order to make the impact of this publicity aid as strong as possible, it has been decided to have, in addition to posters, window stickers and so on, transfers in black and white which, it is hoped, members will use on their vans, farm notice boards and the like.

The transfers will be in black and white so as to avoid any colour clash in the matter of vans and lorries and the three sizes in which the transfer will be available, together with prices are:—

7	inches by	9	inches deep	5/-	each
14	,, ,,	18	,, ,,	6 -	,,
28	,, ,,	36	,, ,,	8/-	,,

An instruction leaflet will be enclosed with each transfer or set of transfers, and the transfer of the symbol to the side of a van or a notice board is simplicity itself. The charges, especially when compared with sign writing, are very cheap and the impact which this publicity aid could have on mushroom publicity cannot be measured.

The colour of the symbol is white with the outline in black as the example produced herewith.

A full report of the launching of " Monty " and the Information Bureau will appear next month.

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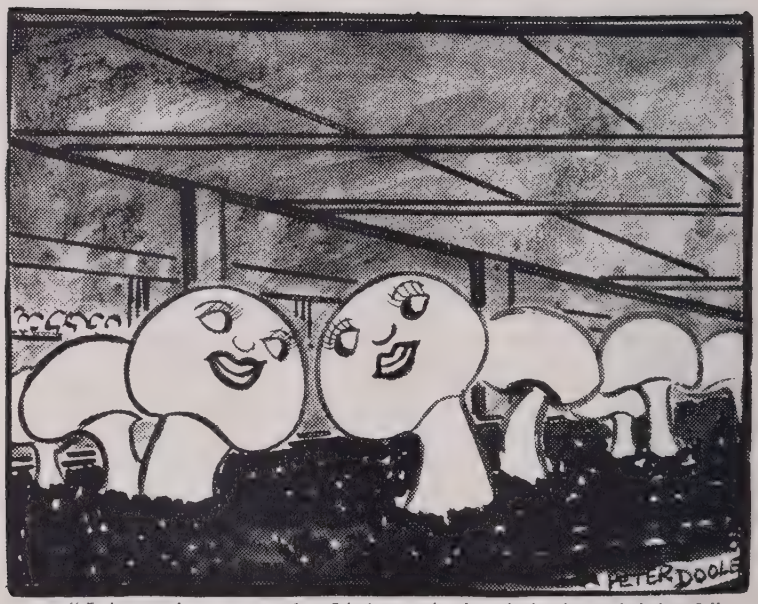

" Is it true that tray number 5 is 'expecting' again in six weeks' time ? "
" Don't ask me ! I'm just as much in the dark as you are ! "

1961 CONFERENCE AND EXHIBITION

For the first time ever the MGA's Annual Conference and Exhibition is being held in East Anglia—at Lowestoft on the Suffolk/Norfolk border on 16th, 17th and 18th October.

The Exhibition will be staged in the Pavilion Ballroom, which is situated on the South Pier and almost immediately opposite The Royal Hotel, which will be the headquarters hotel. This hotel, the largest in Lowestoft, overlooks the sea. Accommodation at this hotel, which has about 65 rooms, is strictly limited and members are urged to make their own bookings, direct to the hotel, without delay. A block reservation has been made for members of the Executive Committee.

Lowestoft, which is close to the Broads, is a delightful if quiet East Coast resort, famous for its fish market.

Hotel charge is 52/6d. per head for full board irrespective of whether a single or a double room is occupied. Bed and breakfast only is 30/- per head, 9/6d. is the charge for lunch and a four course dinner will cost 12/6d. There is a 10% surcharge to cover all gratuities.

The complete programme has not yet been finalised but there will be the usual " get together " on Monday evening, 16th October, with a dance either on the Tuesday or the Wednesday evening. It is hoped to arrange a coach trip to Sandringham for the ladies and there is a possibility of a visit being arranged, for all delegates, to a large mushroom farm.

Who paid the claims?

Happily, for the farmer concerned, the N.F.U. MUTUAL; for this tree, growing on his land, fell on a passing 'bus and injured several passengers.

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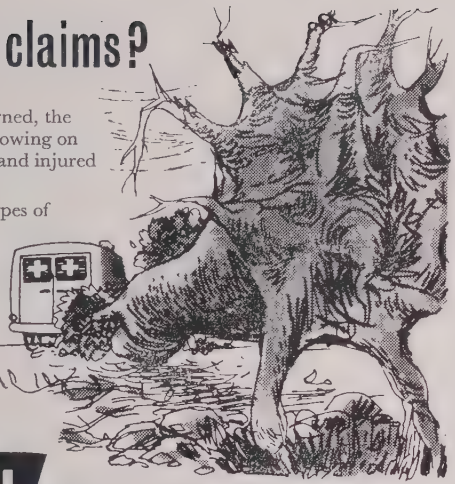

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